

5 Keys for Building a Flexible, Integrated eMobility Strategy

Leveraging Stem's Athena® platform for solar, battery storage,
and commercial electric vehicle charging infrastructure

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The Rise of eMobility

Globally, a quarter of greenhouse gas (GHG) emissions result from transportation, and about 95% of all transportation is fossil-fueled, according to the UN. Transitioning to electric vehicles (EVs) powered by renewable energy is therefore a cornerstone strategy for decarbonization, both in the US and abroad.

eMobility presents unique challenges and opportunities for fleet operators, transit agencies, and others who must not only electrify fleets but also understand and install an entirely new type of fueling infrastructure. This will require an operational transformation starting with new procurement mechanisms, driver training, and maintenance plans. Yard operators with decades of experience negotiating diesel supply agreements, for example, will now have to negotiate solar power purchase agreements.

This eBook is meant to help any organization considering integrating solar, battery storage, and EV charging understand how to capitalize on the transition to electrified fleets and start developing a flexible, integrated EV strategy to expedite and maximize their EV investments.

athena[®]

Stem's Athena[®] platform, when digitally integrated to the EV charging system, gathers data and uses AI-driven machine learning to predict the future and make optimal operating decisions for economic, environmental, or resilience benefits. Athena unlocks value in utility bill savings, GHG reductions, charging resilience, and more!

State-Level Drivers

State mandates and incentives are prompting a growing number of companies, state and local governments, and other organizations to transition fleets to zero-emissions vehicles. No fewer than 17 U.S. states have enacted policy frameworks to transition all new sales of medium- and heavy-duty vehicles to zero-emission vehicles by 2050, with California leading the way.

California's electrification mandate for trucks and buses, which takes effect in 2024, is already affecting fleet operators – both in their near-term purchasing activities as well as their longer-term business and procurement strategies. Massachusetts, New Jersey, New York, Oregon, and Washington have also adopted this mandate.

Another California policy, the Low Carbon Fuel Standard (LCFS), incentivizes electricity as a low-carbon transportation fuel and allows EVs to generate and trade LCFS credits in the state's LCFS market. Oregon has implemented its own version of an LCFS program, and it's under consideration in several other states.

If history is a guide, California's policy innovations will continue to be replicated in other states. And when you consider EV-specific momentum alongside the broader net zero and 100% clean energy targets set by 21 states, DC, and Puerto Rico – collectively home to over half the U.S. population – you start to see a whole lot of opportunity for EVs across the U.S.

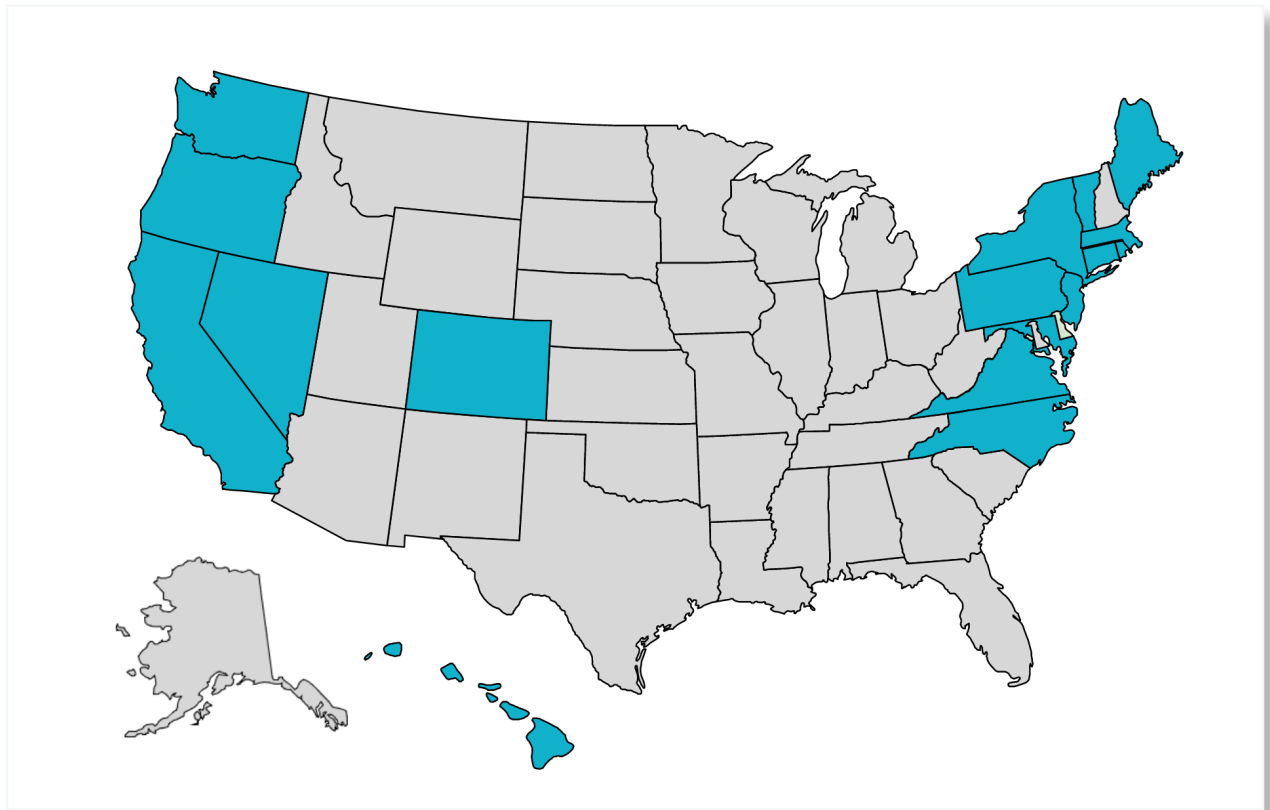


Figure 1: A map of 17 states with a medium- to heavy-duty vehicle electrification action plan

Source: ZEV Taskforce



Federal Incentives

Inflation Reduction Act

At the federal level, the Inflation Reduction Act (IRA) has been described as the largest clean energy and climate investment in U.S. history. Passed in August 2022, the IRA will provide stable, unprecedented support for all types of clean energy technologies, including EVs, for at least a decade.

Highlights of the IRA's support for EVs include:

- Commercial EV tax credit up to \$40,000 through 2032
- EV Charging Infrastructure tax credit through 2032
 - 30% tax credit per charger (max \$100,000 per charger)
- Expanded Solar and Storage credits
 - Standalone storage now eligible to receive 6-50% credit
- \$36 billion in incentives and programs to accelerate EV adoption and lower charging infrastructure costs
- \$3 billion for USPS vehicles and charging infrastructure
- \$1 billion for EVs and charging infrastructure to replace delivery trucks, school buses, garbage trucks, city transit buses, and other Class 6 and 7 heavy-duty vehicles

National Electric Vehicle Infrastructure Program

Another important EV market driver is the National Electric Vehicle Infrastructure (NEVI) Program, established in 2021 as part of the Bipartisan Infrastructure Law (also known as the Infrastructure Investment and Jobs Act). NEVI will provide states with \$5 billion over five years to create a national network of EV charging stations.

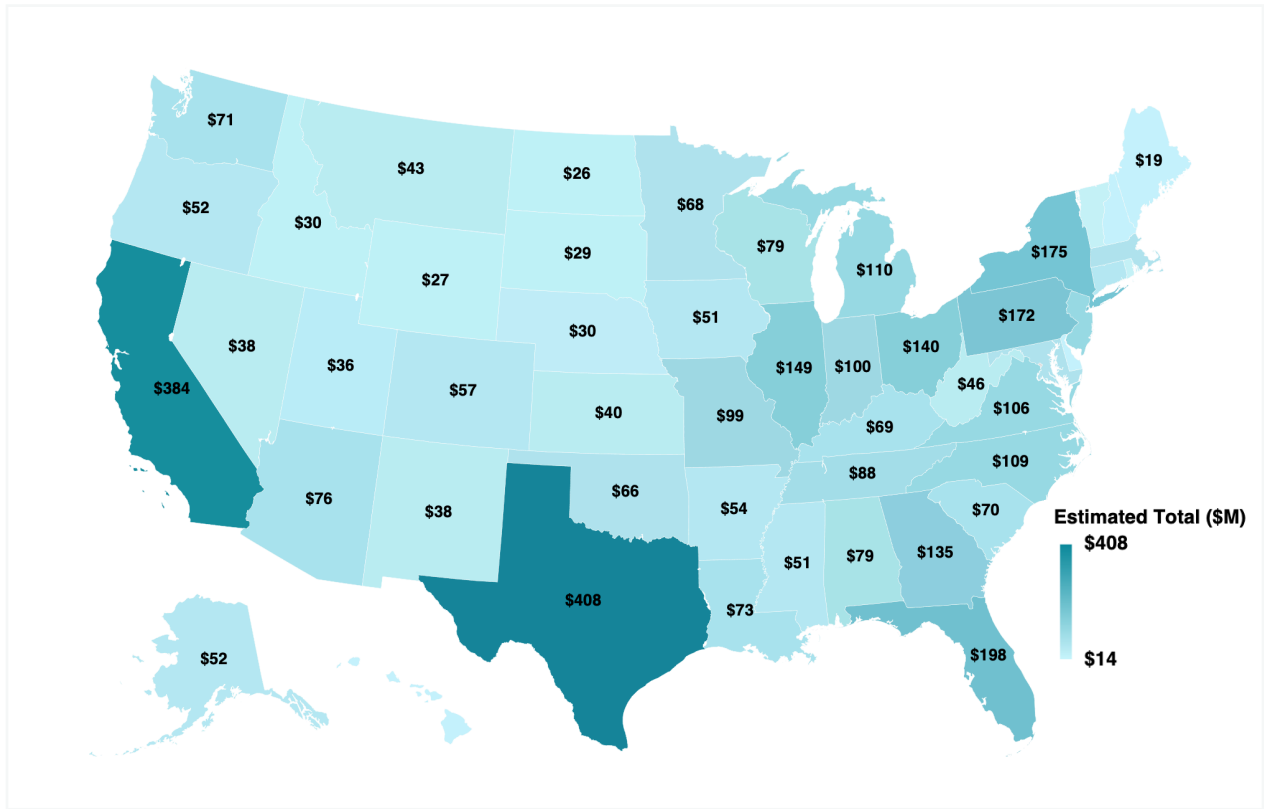
Under the NEVI program, the federal incentive can offset up to 80% of project costs. Additionally, these projects can also claim the 30% ITC under the Inflation Reduction Act to reduce the remaining costs of installing charging stations, solar, and batteries. With such a generous incentive, adding storage to new EV chargers near major transportation corridors will likely make sense across many parts of the U.S.

States expect to begin NEVI-funded EV infrastructure deployments this year. Several states – including key energy storage markets like Texas and Massachusetts – are encouraging co-deployment of solar and storage at EV charging sites, particularly to boost resilience in outage-prone areas, support rural areas facing grid capacity limits, and minimize demand charges.

NEVI is worth tracking by all parties in the eMobility ecosystem – including retail outlets, convenience and fueling stations, quick-serve restaurants, and other businesses that will serve as NEVI site hosts, as well as the organizations whose zero-emissions fleets these sites will help power.

NEVI funds will also supercharge EVSE projects

\$5B over 5 Years // RFPs and application processes opening across the US starting Q4 2022



Site Eligibility

- Open to the public
- Four charging stations
- At least 150 kW per port
- Total capacity of at least 600 kW

NEVI Projects

- Up to 80% coverage from federal funding
- Distributed through RFPs & Grants
- Applicants will be whoever is the owner & operator of the site

Storage for NEVI Sites

- Sites must have >97% reliability
- Sites must maintain reasonable prices and minimize demand charges
- Sites should consider DER integration and use load management for grid stability

Figure 2: Federal funds direct to states to build out EV charging sites every 50 miles within 1 mile of an interstate exit

Source: U.S. Federal Highway Administration

Building a Flexible, Integrated eMobility Strategy

Understanding how fleet electrification can transform operations is only part of an effective eMobility strategy. Other aspects relate to navigating utility and grid constraints, leveraging vehicle electrification to meet cross-cutting objectives, and ensuring that investments yield maximum returns over time.

Solar and battery storage are increasingly being co-deployed with EV charging stations for their unique, multi-faceted value proposition that aligns with fleet operators' needs. This section outlines five key steps organizations can take to leverage renewables and storage as part of a flexible, integrated eMobility strategy.

1. Increase peak charging power

Medium- and heavy-duty EVs can place considerable demands on the electricity grid. These vehicles are often part of fleets requiring multiple DC fast chargers in centralized vehicle charging depots. DC fast chargers produce significant charging loads – up to 18x the power requirements of a “Level 2” charger used with passenger EVs. But even passenger EVs can spell trouble for the grid when they're used with DC fast chargers in depots, as can be the case with rideshare and delivery companies.

The large investment and power requirements of charging depots in the passenger, medium-, and heavy-duty segments create opportunities for solar and storage to help EV fleet operators save time and money.

For electric utilities, managing EV charging impacts on the grid is a central challenge of electrifying transportation. For fleet operators, this means that requests to serve new EV charging loads can trigger expensive utility charges and mire projects in lengthy delays.

Deploying distributed energy resources (DERs) like solar and storage along with EV charging infrastructure can enable peak charging power above what the utility grid can provide and help alleviate grid impacts in ways that are cost-effective for both fleet operators and utilities, and enable organizations to meet peak charging needs and expedite projects despite grid constraints.

And while EV charging loads may initially be relatively low, installing battery storage and solar up front allows for a fully interoperable charging solution – something that may not be possible if storage is added to EV chargers later.

2. Maximize operational savings

A common concern organizations may have about adding new EV chargers is how they might increase utility bills. This is especially true when facilities are building charging infrastructure for the first time.

Smart energy storage pairs easily with EV chargers to help a range of customers manage costs and electrical loads, while also future-proofing facilities against tariff and program changes and maximizing opportunities to monetize EVs as distributed clean energy resources.

Battery optimization software is an essential piece of this puzzle. Platforms that can demonstrate best-in-class performance on capturing key energy storage value streams – such as Utility Bill Optimization, Energy Arbitrage, and Demand Response – offer a differentiated cost-control solution for EV fleet operators.

Naturally, part of maximizing operational savings is ensuring you capture all available financial incentives. Understanding eligibility requirements, navigating applications, and modeling the financial implications of different project configurations are all core competencies you should look for in selecting expert partners.

3. Enable resilience for fleets & operations

Many organizations contemplating fleet electrification know they want resilient EV charging to reduce operational risk. To enable resilience, a centralized platform coordinates energy assets on a clean energy microgrid, while enabling EVs to charge even during a blackout.

Let's say a factory facing unreliable electric supply conditions has started using EV delivery trucks. During critical months where the blackout risk is high, the software platform can reserve the battery for backup. During the rest of the year, the system is "backup capable" but primarily used to capture other value streams from Utility Bill Optimization, Energy Arbitrage, Demand Response, and others as available.

The main customer benefit of these microgrid configurations is ideal charging uptimes, which is achieved through seamless integration of all generation sources to provide fast-response backup power with no GHG emissions for EV charging stations. The battery can be optimized for any set of value streams and can also be islanded to supply critical facilities during emergencies.

4. Enhance ESG performance & disclosure

The clean energy transition is being driven as much by private sector leadership as it is by policy and technology developments. Corporate environmental, social, and governance (ESG) commitments have become the norm, with at least one-fifth of the world's largest public companies having set net-zero targets.

These commitments extend to fleet electrification. Globally, the Climate Group reports that over 125 companies have committed to deploy over 5.5 million EVs in their fleets by 2030. Over the same timeframe, for example, Sysco has pledged to electrify 35% of its global fleet and add nearly 2,500 electric trucks in the US alone.

For sustainability-minded companies, the benefit of adding solar and storage to EV chargers is clear: it maximizes on-site renewable energy use by utilizing stored solar energy locally, so fleets can "charge from the sun" – even overnight. If the project elects to implement a clean energy microgrid, the site is able to use clean resources to charge when the grid is offline instead of fossil-based backup. And the advanced GHG emissions tracking capabilities offered by some energy asset management platforms can help ESG leaders credibly report on progress toward goals and identify further reduction opportunities.

5. Choose the right expert partners

eMobility is a fast-moving and dynamic field, and successful strategies are built on many different types of expertise. Clarifying an organization's goals for its own fleet electrification program is no small task. Add to that the external complexities around navigating utility requirements and tariffs, capturing financial incentives, sourcing the right hardware amid supply chain challenges, ensuring installations are future-proofed to deliver maximum lifetime returns, and a host of other issues – and many organizations may feel option paralysis.

Partnering with the right experts can help. Industry leaders with expertise across fleet charging, project development, financing, and energy asset optimization can be instrumental in helping organizations realize successful eMobility strategies. Valuable expert services include:

- Understanding and capitalizing on IRA and NEVI incentives
- Project development that ensures EV Charging and DER systems are sized right the first time, reducing engineering cycles
- Finance projects for ease of contracting and immediate positive IRR project
- Interoperability between systems reduces operating risk, adds value over project life
- Simplifying installations with a customized, interoperable offering
- Providing reliable access to Tier 1 hardware solutions
- Facilitating enrollment in state and utility programs
- Maximizing the lifetime economic, environmental, and resilience value of energy assets with a proven optimization platform

Getting Started

Developing your eMobility strategy starts with assembling the right information. Building this data set won't just enable productive collaboration with internal stakeholders and executives. It will also tell external experts what they need to know to start supporting your goals and help develop the eMobility solution that's right for you.

Some of the most important information about your organization's fleet electrification plans would include:

- Goals and drivers, including relevant corporate and government mandates
- Routes and expected charging location(s)
- Current or potential EV OEMs or EV equipment providers
- Fueling cost information (current vs. EV charging on relevant utility tariffs)
- Fleet size and general purpose
- Vehicle duty type and operational purpose
- Facilities and readiness/capacity for DERs

It's also important to understand which key value proposition is really driving your project(s) and/or overall strategy:



Overcoming grid constraints

- How long of a delay are you facing?
- Will the utility charge you for the upgrade?
- How much peak power do you need?



Enabling resilience

- What is the value of resilience to you?
- How much energy do you need to operate your fleet for 24 hours with no grid connection?



Reducing costs

- What is your load profile, 8760 solar data, and relevant EV tariff to calculate applicable program revenues and market incentives?



Enhancing ESG performance

- How does fleet electrification fit into your overall sustainability strategy?
- Which markets are you most focused on?
- How valuable is GHG emissions tracking to you?

If you're a fleet operator with heavy-duty EVs or otherwise planning to install high power chargers, energy storage may be an especially valuable solution for your organization. Any project with charging loads greater than 500 kW presents a compelling opportunity for battery storage to help customers realize significant value.

You can always contact Stem for expert support in developing your eMobility strategy. But for now, here are some suggested next steps:

- Be proactive about talking to stakeholders and understanding their priorities and needs – and particularly which value proposition(s) are most relevant to them
- Start thinking about your project qualifications, budget cycle, ESG initiatives, and implementation timelines
- Identify "must-run" fleets that need to charge during outages and may therefore require short- and long-term backup power options
- Familiarize yourself with new tax incentives under the IRA
- For retail chains and others who may be good candidates for NEVI funding, contact your state transportation agencies for updates on how this funding will be disbursed

Working with Stem

Stem is a global leader in AI-driven clean energy solutions and services. As experts in monetizing and optimizing energy storage and distributed renewables, we work with the largest Fortune 500 companies, project developers, solar EPCs, asset owners, and utilities to manage the process of designing, procuring equipment, deploying, and operating clean energy projects.

With a network of hundreds of deployment partners and more than one billion runtime hours on our Athena platform, Stem is at the forefront of helping businesses leverage energy storage and distributed renewables as part of their clean energy strategies.

Formulate your eMobility strategy

Stem understands that as a fleet operator or owner, you are evaluating your fleet electrification strategy to ensure that there is sufficient charging capacity for your routes, while having a resilient solution at site to ensure that adequate power is available for charging during grid outages.

To benefit from Athena's co-optimization capabilities, you will first need to secure a battery for your EV project. Stem streamlines the process of securing batteries for your EV project to help you overcome grid limitations, avoid multi-year project delays and enable peak charging.

Stem's eMobility offering provides flexible energy asset control for EV-charging microgrids that enables a dynamic "Reservable Backup" for storms, while ensuring your ability to charge during grid outages. You are likely considering fleet electrification as a way to meet your ESG goals. Stem's eMobility offering maximizes the carbon-free impact of renewables and accelerates toward Net Zero by charging fleets using stored on-site solar energy or energy imported from the grid during times of high renewable production.

Utilizing electricity as your new fuel means that lowering your utility bill would be a priority. Our solution maximizes operational savings by reducing demand charges and Time-of-Use charges, while utilizing the batteries for participation in Utility programs. Athena controls the battery to refill batteries at low cost or uses stored solar energy to enable fleet charging even during peak periods when energy from the grid is more costly.

Pre-integrated energy systems are faster, cheaper and more risk-free to deploy for the end customer. Stem's pre-integrated systems are key to:

- Properly size the systems relative to one another
- Achieve the operating outcome you want
- Minimize planning iterations and engineering cycles and costs
- Avoid clashes between two advanced technology platforms.
- Avoid non-integrated system combinations that run the risk of two control systems oscillating

The main differentiators that set Stem's eMobility solution apart and lead to better outcomes for our customers include:



Stem's Athena Platform



eMobility Industry Partnerships



Battery Supply Agreements



Ongoing Expert Support

Case Study

Penske Truck Leasing



When software issues initially hampered the project, Penske Truck Leasing's first priority became finding a proven software solution that could deliver superior EV charging results. And because this project was Penske's first foray into leveraging energy storage for EV fleet charging, it needed an expert partner to provide a turnkey experience. With Stem's extensive track record, service dedication, and best-in-class Athena platform, we excelled across the board.

To maximize project revenues, Athena first modeled battery performance and charging behavior under a range of potential tariffs. Now Athena optimizes EV charging while providing a real-time window into system operations for Penske. Since starting the pilot, smart energy storage has driven a 40% decrease in Penske's site peak energy consumption. Athena also ensures the project reduces GHG emissions in accordance with California's Self-Generation Incentive Program (SGIP).



"We collaborated with Stem and other suppliers in designing and implementing the EV charging infrastructure. We then used Stem's Athena® smart energy software to optimize the electricity requirements associated with charging commercial electric trucks. We've been pleased with the initial results, and we continue to evaluate expanding the use of this AI-driven energy storage system as new charging positions equipped with supplemental battery storage are established."

– Sean Yentsch, Vice President Facilities at Penske

Stem's Athena® Platform

Athena is Stem's trusted enterprise platform that unlocks flexibility across the clean energy value chain. With over a billion runtime hours logged across more than a decade of experience, Athena underlies all of Stem's integrated solutions to improve returns and maximize the economic, environmental, and resiliency value across energy assets.

The Athena platform is core to Stem's eMobility solution and uses AI-driven machine learning to deliver best-in-class optimization of clean energy assets. Athena learns from EV charging behaviors to optimize batteries and solar PV, allowing customers to maximize EV-related value streams over the full operating life of a project.

With the Athena platform, Stem can deliver software "on demand," allowing us to continuously improve performance and extend capabilities. Athena also allows customers to mix and match hardware solutions and service providers, so customers can install the project that's right for them.

Stem works closely with EV charging companies to ensure seamless operation. And as their deployments grow over time, Stem customers will benefit from having a single trusted partner and a unified optimization platform capable of managing entire portfolios.

Key Features of Athena's integrated solar, storage, EV offering



Software and services



EV charging hardware supervisory control



Energy for fleet sharing and full site energy management



ESS procurement and operation



Master site design support

eMobility Industry Partnerships

Stem actively forges key partnerships with eMobility industry leaders to simplify and accelerate fleet electrification. In an ecosystem built on multiple technologies that don't naturally talk to each other, there's tremendous value in having a pre-integrated solution that can deliver a customized, integrated offering and provide access to top-tier EV charging hardware.

Recent and upcoming Stem partnership announcements include market leaders in fleet charging, project development, and financing. These affiliations broaden and deepen Stem's eMobility offering, enabling world-class project planning, design, and implementation alongside streamlined financing and expertise in a wide range of industries.

Battery Supply Agreements

Stem has secured long-term supply agreements and allocations with the world's leading battery manufacturers, providing critical access to hardware for our customers and partners despite widespread global supply chain challenges.

Battery procurement may become more challenging in the wake of the IRA, as battery OEMs adjust to increasing demand and complex domestic content requirements – making reliable access to battery supply an increasingly key benefit of working with Stem.

Secured OEM partnerships mean:

- Preferred access to global Tier 1 battery suppliers
- Competitive prices and advantageous payment terms
- Reliable capacity and deployment timelines
- Enhanced warranty administration & management

Ongoing Expert Support

Finally, Stem's ongoing expert support is a major success factor for our customers and partners. With over a decade of experience in pioneering the monetization of distributed energy technologies, Stem offers a full suite of services that is unmatched in the industry.

Our experts and capabilities support customers from the earliest project discussions through development, commissioning, and operation. Our Programs team, for example, coordinates with local utilities to ensure projects maximize revenues, while our Supply Chain team secures the best pricing and warranty terms.

Expert support ensures:

- Simplified implementation
- Lower design, development, and operational risk
- Accelerated time to value
- Peak performance with minimal downtime
- Full value realization

About Stem, Inc.

Stem (NYSE: STEM) is a global leader in AI-driven clean energy solutions and services.

Stem (NYSE: STEM) provides clean energy solutions and services that maximize the economic, environmental, and resiliency value of energy assets and portfolios. Stem's leading AI-driven enterprise software platform, Athena® enables organizations to deploy and unlock value from clean energy assets at scale. Powerful applications, including AlsoEnergy's PowerTrack, simplify and optimize asset management and connect an ecosystem of owners, developers, assets, and markets. Stem also offers integrated partner solutions that improve returns across energy projects, including storage, solar, and EV fleet charging.

For more information, visit www.stem.com.

